

Virtual Lab: Enzyme Controlled Reactions

Introduction:

To sustain the processes of life, a typical cell carries out thousands of biochemical reactions each second. Many of these reactions require the help of enzymes. Enzymes are proteins that speed up the rate of chemical reactions. Many important processes in the body involve the work of enzymes, including the digestion of nutrients such as carbohydrates, proteins and fats.

Enzymes are organic catalysts. A catalyst is a chemical that controls the rate of a reaction, but is itself not used up in the process. Reactions that are accelerated due to the presence of enzymes are known as enzyme-catalyzed reactions.

Enzymes are proteins that accelerate chemical reactions but do not change themselves in the reaction. Enzymes enable molecules to undergo chemical changes, forming new substances called products. Substrates are molecules that are acted upon by enzymes. For instance, amylase, an enzyme found in saliva, helps break down complex starch molecules (substrates) into smaller sugar molecules (products). In other biochemical reactions, substrates require assistance of specific enzymes to form new products.

Each substrate fits into an area of the enzyme called the active site. This fitting together is often compared to a lock-and-key mechanism. However, researchers believe that the fit between enzyme and substrate need not be exact. Enzymes are viewed as flexible keys that can shape and conform to the shape of the substrate.

Complete the lab write up on your own paper. You must clearly label each section and complete.

Scientific Questions: How do substrate concentration and pH affect enzyme-controlled reactions?

Hypothesis: Use If_____, then _____ because format.

Materials:

- pH solutions at pH 3, 5, 7, 9, 11
- 0.5g, 1.0g, 2.0g, 4.0g, and 8.0g of Lactose
- Test tubes

Procedure: ***You do not have to rewrite the procedure, just write see virtual lab. Read carefully!*

1. Open the Virtual Lab: Enzyme Controlled Reactions at <http://bit.ly/1Qw4Zzx>
2. Read the question and purpose on the left side of the screen. The virtual lab simulation will be on the right side of the screen.
3. Click the monitor in the lab simulation to watch a video about enzyme action.
4. Scroll down the “Question” column and follow the procedure to complete the virtual lab. You must test each lactose sample at all pH levels: 3,5,7,9, and 11.
5. Record your data in your data table.

Data:

Rate of the Reaction at:					
Amount of Substrate (Lactose)	pH 3	pH 5	pH 7	pH 9	pH 11
0.5 g					
1.0 g					
2.0 g					
4.0 g					
8.0 g					

Data Analysis:

1. Graph the data. Be sure to include title, axis labels, scale, and key. ***Hint: if you are having trouble setting up the graph, select the Data Table button at the bottom of the lab.*
2. What is the optimal (best or ideal) pH for the lactase-catalyzed reaction, and why?

Conclusion:

Write a CER conclusion to answer the question: How do substrate consternation and pH affect enzyme-controlled reactions? Use actual data from your data table for your evidence and explain how this answers the question for your reasoning.